

1 **REBUTTAL TESTIMONY OF**
2 **THOMAS E. HANZLIK**
3 **ON BEHALF OF**
4 **DOMINION ENERGY SOUTH CAROLINA, INC.**
5 **DOCKET NO. 2019-184-E**

6 **Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND**
7 **OCCUPATION.**

8 A. My name is Thomas “Tom” Edward Hanzlik. My business address is 601
9 Old Taylor Road, Cayce, SC 29033. I am the Manager, System Control for
10 Dominion Energy South Carolina, Inc. (“DESC” or the “Company”).

11 **Q. WHAT IS YOUR EDUCATIONAL BACKGROUND?**

12 A. In 1981, I graduated from Clemson University with a Bachelor of Science
13 degree in Electrical and Computing Engineering.

14 **Q. WHAT IS YOUR EMPLOYMENT BACKGROUND?**

15 A. I began my career with DESC in 1987 when I accepted a job with South
16 Carolina Electric & Gas Company. I served in various roles during my career at
17 DESC, including but not limited to: Manager Operations Planning, Manager Large
18 Customer Accounts, General Manager Instel, Inc (a SCANA Subsidiary) and Power
19 Quality Engineer. However, for the last 7 years, I have worked in my current role

1 as the Manager of System Control Center. Prior to working in the utility industry,
2 I was employed by Square D Company as an Applications Engineer for industrial
3 motor control equipment.

4 **Q. HAVE YOU EVER TESTIFIED BEFORE THE PUBLIC SERVICE**
5 **COMMISSION OF SOUTH CAROLINA (THE “COMMISSION”)?**

6 A. No.

7 **Q. DID YOU PREVIOUSLY FILE DIRECT TESTIMONY WITH THE**
8 **COMMISSION IN THIS PROCEEDING?**

9 A. No.

10 **Q. WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?**

11 A. The purpose of my rebuttal testimony is to discuss the response of Dominion
12 Energy South Carolina, Inc. (“DESC” or the “Company”) to certain issues raised in
13 the direct testimony of Mr. Derek P. Stenclik filed on behalf of the South Carolina
14 Coastal Conservation League and the Southern Alliance for Clean Energy
15 (collectively, “CCL/SACE”). As the manager of DESC’s Systems Control Center
16 (“SCC”), I am uniquely qualified to address the points raised by Mr. Stenclik
17 regarding DESC’s need for reserves and the reliability challenges associated with
18 variable generation. Finally, I address Mr. Stenclik’s failure to acknowledge

DESC's obligation to comply with the North American Electric Reliability Corporation's ("NERC") mandatory reliability standards.

Q. PLEASE DESCRIBE YOUR DUTIES AS MANAGER OF SYSTEM CONTROL CENTER FOR DESC.

A. The SCC is a transmission system control center in which DESC monitors and controls its transmission system, dispatches its generation fleet, and reliably meets customer load in real-time. The SCC's primary function is to maintain compliance with regulations that govern the bulk electric system and to ensure safe and reliable electric service to our customers. Doing so requires us to plan for, anticipate, and respond to events such as changes in system load, unexpected equipment outages, generating facility trips, and other system related events to ensure reliability and minimize risk within our Balancing Authority ("BA") as well as risk or impact to the Eastern Interconnection. Throughout my rebuttal testimony I discuss the role of the BA, and the following definitions from the NERC Glossary of Terms will be helpful:

- a. Balancing Authority – is the defined term for a NERC-registered entity that integrates resource plans ahead of time, maintains load-interchange-generation balance within a Balancing Authority Area, and supports interconnection frequency in real time.

- 1 b. Balancing Authority Area – the collection of generation, transmission, and
2 loads within the metered boundaries of the Balancing Authority. The Balancing
3 Authority maintains load-resource balance within this area.

4 The following are key tasks a BA performs:

- 5 a. Calculate Area Control Error (“ACE”) within the reliability area.
- 6 i. ACE - The instantaneous difference between a Balancing Authority’s net
7 actual and scheduled interchange, taking into account the effects of
8 Frequency Bias.
- 9 b. Operate the BA Area to maintain load-interchange-generation balance.
- 10 c. Review generation unit commitments, dispatch, and load forecasts, and direct
11 generators as necessary to meet system requirements.
- 12 d. Formulate an operational plan (generation unit commitment, bulk power
13 transactions, unit and line outages, etc.) for reliability evaluation.
- 14 e. Approve Arranged Interchange with neighboring BA Areas from a bulk power
15 supply and ramping ability perspective.
- 16 f. Implement Confirmed Interchange transactions with neighboring BAs.
- 17 g. Operate the BA to contribute to Interconnection frequency.
- 18 h. Monitor and report control performance and disturbance recovery.
- 19 i. Provide balancing and energy accounting, and administer inadvertent energy
20 paybacks.
- 21 j. Determine needs for reliability-related services.

1 k. Deploy reliability-related services.

2 l. Implement emergency procedures per internal System Operating Procedures
3 and the NERC Standards.

4 **Q. PLEASE EXPLAIN NERC's ROLE IN PROMOTING AND MAINTAINING**
5 **THE RELIABILITY OF THE US ELECTRIC GRID.**

6 A. The 2003 blackout, which was initiated in the Midwestern United States and
7 cascaded into Canada and the Northeastern United States, causing 50 million people
8 to lose power. In response, Congress included requirements in the Energy Policy
9 Act of 2005 for an independent Electric Reliability Organization ("ERO"). The
10 ERO reports to FERC and is tasked with developing and enforcing mandatory
11 reliability standards. The ERO has the authority to levy penalties up to \$1 million
12 per day per violation. FERC named NERC as the ERO and through delegation
13 agreements authorized seven Regional Reliability Organizations ("RRO") to form
14 and monitor compliance with the NERC reliability standards. SERC was named the
15 RRO for the Southeast and authority to monitor DESC's compliance through regular
16 audits and other oversight activities.

17 As a BA, DESC must comply with the NERC Resource and Demand
18 Balancing ("BAL") Reliability Standards. The following standards are specifically
19 applicable to this proceeding:

Standard Number	Title	Purpose
BAL-001	Real Power Balancing Control Performance	To control Interconnection frequency within defined limits
BAL-002	Disturbance Control Standard – Contingency Reserve for Recovery from a Balancing Contingency Event	To ensure the Balancing Authority or Reserve Sharing Group (“RSG”) balances resources and demand and returns the BAs or RSGs Area Control Error (“ACE”) to defined values following a Reportable Balancing Contingency Event
BAL-003	Frequency Response and Frequency Bias Setting	To require sufficient Frequency Response from the BA to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations and supporting frequency until the frequency is restored to its scheduled value. To provide consistent methods for measuring Frequency Response and determining the Frequency Bias Setting.

- 1 Compliance with these standards is mandatory and critical to ensure the reliability
- 2 of DESC’s BA Area and the entire Eastern Interconnection.

1 **Q. DOES DESC PLAN AND OPERATE ITS GENERATION DISPATCH AND**
2 **TRANSMISSION SYSTEM IN COMPLIANCE WITH THESE**
3 **RELIABILITY STANDARDS?**

4 A. Yes. These are mandatory reliability requirements. DESC is routinely
5 audited through periodic spot checks, quarterly and annual reporting, and also more
6 comprehensive audits that occur approximately every three years. Failure to comply
7 with these mandatory reliability standards can result in a combination of fines,
8 penalties, and mandatory mitigation measures imposed by SERC, NERC or FERC.

9 **Q. PLEASE EXPLAIN HOW DESC EVALUATES AVAILABLE**
10 **GENERATION RESOURCES AND ESTABLISHES OPERATING**
11 **RESERVES IN ORDER TO MEET LOAD ON A DAILY BASIS.**

12 A. DESC develops a Balancing Integrated Operating Plan (“Daily Generation
13 Plan”) twice daily as a guide for our System Controllers to use when dispatching
14 generating resources within the DESC BA. As part of this process, DESC evaluates
15 an hourly load forecast against available generation in each hour to determine
16 operating reserves and resource adequacy. This evaluation specifically focuses on
17 the most critical hour of the day, called the peak hour, when instantaneous demand
18 is or will be the highest in the 24-hour planning period.

19 The functional capabilities(ramping, voltage control, load following, and
20 maximum output) of each available generator are considered to ensure adequate

1 regulating reserves, flexible reserves, and contingency reserves (hereinafter referred
2 to individually and collectively as “Operating Reserves”) can be collectively
3 provided as needed across the peak hour of the day. All generating resources within
4 our BA, including solar generation, are considered along with their characteristics
5 in the development of the Daily Generation Plan and a daily reserve calculation, but
6 not all resources have equal functionality. The functional and operating limitations
7 of any and all generators cannot be ignored. For example, nondispatchable solar
8 generates when the sun and weather conditions allow it to generate. It cannot be
9 called upon to increase its output in emergency situations—whereas gas-fired
10 generation units have the ability to contribute to our response to such reliability
11 events. Additionally, except for a few summer months, solar generation does not
12 support the peak demand of our BAA. Therefore, dispatchable generation must be
13 available to cover reliability events and system peaks because solar cannot
14 functionally provide that reliability benefit.

15 **REBUTTAL TO TESTIMONY OF MR. DEREK STENCLIK**

16 **Q. ON PAGE 5, LINES 5-8, MR. STENCLIK STATES, “FIRST, THE**
17 **ANALYSIS ASSUMED INAPPROPRIATELY HIGH RESERVE**
18 **REQUIREMENTS. THIS IS BECAUSE THE MODELING AND**
19 **PLANNING ANALYSES DO NOT ACCURATELY CAPTURE CURRENT**
20 **OPERATING PRACTICES, WHICH DOES NOT CURRENTLY REQUIRE**

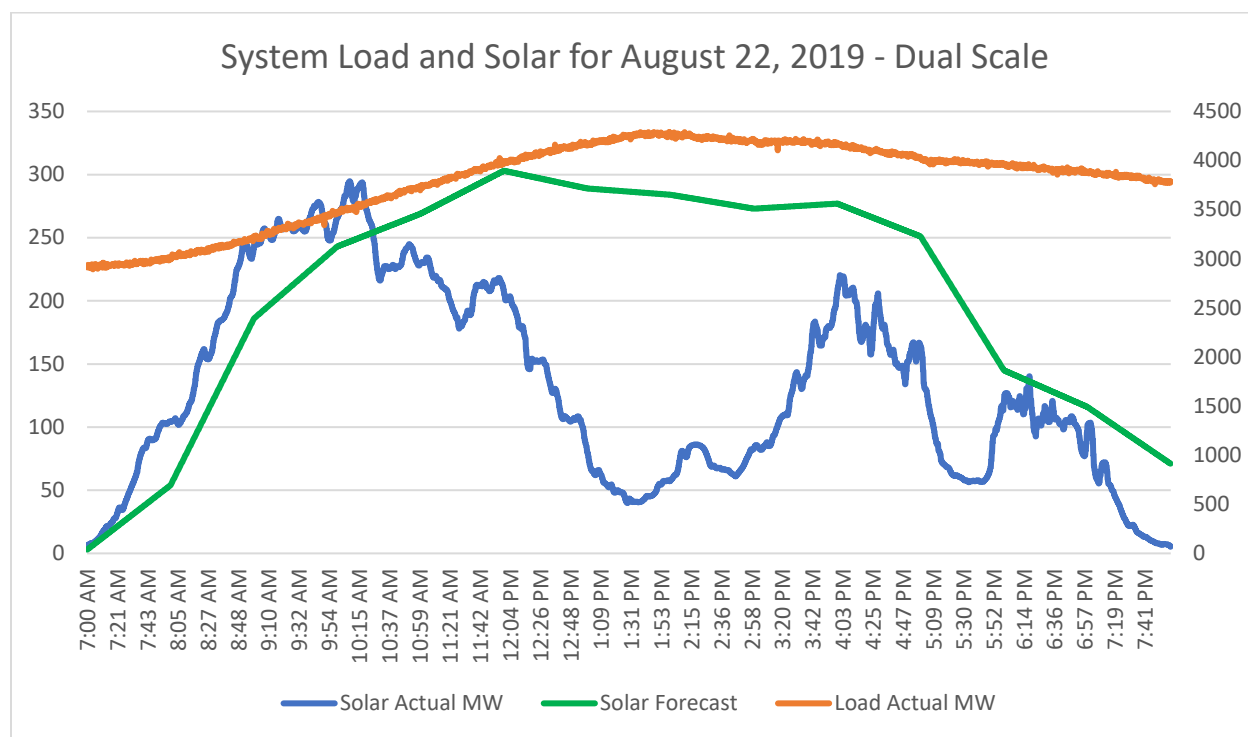
**OPERATING RESERVES FOR EXISTING SOLAR GENERATION. DO
YOU AGREE WITH THIS STATEMENT?**

A. No. Real-time operations of our BA require operating reserves to balance DESC's load and generation at all times and after all contingency events in order to maintain system reliability and compliance with the BAL Standards. Operating reserves are calculated daily to ensure the generating capacity is available to balance load and generation as load increases from its minimum level to the maximum peak hour of the day.

Until recently, the challenge of balancing our system in real-time has been limited to the diversity of loads (lights, hvac, electronics, appliances, manufacturing equipment, pumps, fans, etc.) and outages of traditional generators within the DESC BA. However, with the addition of solar generation and the intermittent production associated with this resource, there is a need for increased Operating Reserves specific to solar generation to maintain compliance with the BAL Standards. Operating experience shows that it cannot be reliably predicted when solar panels will either reduce or increase their output, and therefore we must factor in the variable and significantly unpredictable operating characteristics of solar generation as a factor effecting reliability.

I have included a graph that illustrates solar variability in DESC's recent experience using actual data. The graph shows that on August 22, 2019, at 10:00 AM, solar generation peaked at 293 MW. For the next three hours solar output

1 fluctuated while decreasing by over 80 percent to slightly below 50 MW, which was
 2 a large divergence from the solar forecast. However, DESC's load continued to
 3 increase. Then, over the next three hours solar generation increased by three
 4 hundred percent to 150 MW (as load decreased), before decreasing by the same 300
 5 percent, to 150 MW by late afternoon. During this time DESC had to utilize
 6 generating units with high ramp rates to provide quick generating responses and
 7 maintain reliability. The graph below shows exactly how and why DESC must
 8 maintain Operating Reserves for solar generation and why this need increases as the
 9 installed capability of PV Solar increases to 1,048 MW.



10

1 **Q. ON PAGE 8, LINES 4 THROUGH 8, MR. STENCLIK ADDRESSES THE**
2 **RELIABILITY RISKS POSED BY VARIABILITY AND FORECAST**
3 **ERRORS, AND STATES “EVEN IF ALL OF DESC’S SOLAR**
4 **GENERATION DISCONNECTED SIMULTANEOUSLY, THERE WOULD**
5 **NOT BE A RELIABILITY RISK.” AS MANAGER FOR SYSTEM**
6 **CONTROL, DO YOU AGREE?**

7 **A.** No. Mr. Stenclik seems to ignore how NERC ensures the reliability of our
8 nation’s electric grid and the enforcement of its Standards. The country is split into
9 three interconnections or regions, the Eastern Interconnection, the Western
10 Interconnection and ERCOT (Texas) that are relatively large and independent of
11 one another. Within each region there are BAs, and within each BA there are
12 transmission operators that are all following very similar operating guidelines.
13 NERC promotes reliability by ensuring compliance at each level, really starting with
14 the smallest level and then moving to each larger level. NERC’s mandatory BAL
15 standards reflect this approach. Each individual BA must comply with these
16 mandatory standards to protect the reliability of the overall Eastern Interconnection.
17 Mr. Stenclik seems to suggest the opposite--that the reliability of the lowest level
18 can be ensured by transferring risk and operating stresses to the largest piece—in
19 this case the Eastern Interconnect. This is the opposite of what NERC allows.

1 **Q. PLEASE EXPLAIN NERC’S BAL-001 REQUIREMENT AND EXPLAIN**
2 **HOW A BA’S COMPLIANCE WITH THAT RELIABILITY STANDARD IS**
3 **IMPACTED BY VARIABLE GENERATION LIKE SOLAR.**

4 A. BAL-001 is a mandatory standard that requires DESC as a BA to regulate
5 frequency within its BAA by maintaining frequency within normal limits on a
6 consecutive 30-minute basis. BAL-001 also requires DESC to operate to the
7 Control Performance Standard 1 (“CPS1”) calculated to be greater than or equal to
8 100% for each consecutive calendar 12- month period. Both requirements of BAL-
9 001 require DESC to have Operating Reserves necessary to respond to fluctuations
10 in frequency and ACE. Sudden drops in solar generation as well as sudden spikes
11 in solar generation can greatly impact frequency and ACE. As a result, compliance
12 with BAL-001 has become more difficult with the addition of non-dispatchable
13 solar generation within the DESC BA.

14 For DESC, one of the most challenging times for our system controllers to
15 balance the system occurs during the winter. During the winter, solar generation is
16 completely out of sync with the winter load profile . The typical winter load curve
17 begins with a morning peak just prior to sunrise when there is no solar output.
18 During these early morning hours, solar is not available and DESC’s non-solar
19 generators are near maximum generation output levels while reserves are at the
20 lowest level for the day. Almost always as the sun rises, and over the next couple
21 of hours, system load begins to decrease, and DESC generation begins to ramp down

(in economic order if possible) to lower levels to maintain a balanced system. Contrary to system needs, solar generation begins to ramp up and injects power onto our system as load is decreasing and as DESC's non-solar generation is in turn decreasing. During this time unscheduled and non-dispatchable solar output results in excess generation and high frequency in the DESC BA and the Eastern Interconnect. This surge in generation and resulting high frequency causes compliance issues with BAL-001. The magnitude of this reliability problem and compliance problem is expected to continue to increase as the amount of solar generation increases within the DESC BA and the Eastern Interconnect.

Q. ON PAGE 8, LINES 6 THROUGH 13, MR. STENCLIK THEORIZES ABOUT ALL OF DESC'S SOLAR GENERATION DISCONNECTING SIMULTANEOUSLY. HE STATES SUCH A SCENARIO "MAY" POSE ECONOMIC AND COORDINATION "CHALLENGES" BUT ANY SHORT-TERM MISMATCH BETWEEN GENERATION AND LOAD WOULD RESULT IN AREA CONTROL ERROR WHICH CAN BE ADDRESSED THROUGH COORDINATION WITH NEIGHBORING BAS. DO YOU AGREE THAT SITUATION DOES NOT POSE ANY RELIABILITY CONSEQUENCES FOR DESC AND ITS CUSTOMERS?

A. No, I do not. NERC's BAL-002 reliability standard *requires* a BA to restore the system ACE to zero within 15 minutes. In the event that all solar generation disconnected simultaneously as suggested by Mr. Stenclik, DESC would have to

1 deploy its Operating Reserves to restore its ACE without burdening its neighbors or
2 the Eastern Interconnection. Unlike the loss of a baseload unit, which would allow
3 DESC to call on generation under its reserve sharing agreements, the loss of solar
4 generation due to the inherent intermittency of the resource does not permit DESC
5 to call on neighboring generation assets.

6 Although not discussed by Mr. Stenclik, the presence of variable solar
7 generation does adversely impact DESC's ability to respond to the loss of a baseload
8 unit in compliance with BAL-002. In such a situation, DESC has 15 minutes to
9 restore system ACE. To do this, DESC must quickly ramp up its dispatchable
10 generation. Now consider that during this time, DESC may have solar generation
11 running. On top of losing its generator, DESC may also experience a rapid and
12 unexpected drop in solar output, further stressing the system and further
13 complicating its recovery efforts. Recovering from these events and maintaining
14 compliance with reliability standards like BAL-002 is challenging even without
15 solar. But, as more and more variable solar generation is added, responding to
16 events and maintaining compliance with BAL-002 will become increasingly
17 difficult.

1 **Q. COULD YOU JUST MODIFY YOUR COORDINATION WITH**
2 **NEIGHBORING BAS AS MR. STENCLIK SUGGESTS ON PAGE 8, LINES**
3 **14 THROUGH 19?**

4 A. No. Each BA is responsible for balancing its BAA in real-time. Such a
5 proposal ignores NERC Standards BAL-001 and BAL-002 and seems to ignore
6 NERC's overall approach to reliability. It is important to note that the BAL
7 standards require a BA's compliance and make no exception for issues resulting
8 from variable resources such as solar. Neighboring BAs are also experiencing their
9 own increase in non-dispatchable renewable generation and as a result have their
10 own challenges maintaining reliability and compliance with the BAL Standards.

11 **Q. ON PAGE 5, LINES 21 -23 AND PAGE 6, LINES 1-2, MR. STENCLIK**
12 **STATES, "THE ANALYSIS ALSO FAILED TO INCLUDE SIGNIFICANT**
13 **ADDITIONAL RESERVE CAPABILITY FROM THE FAIRFIELD**
14 **STORAGE PLANT AND FROM INTERRUPTIBLE LOAD THAT ARE**
15 **APPROPRIATELY AVAILABLE AS SOLAR FORECAST ERROR**
16 **RESERVES. FAIRFIELD PUMPED STORAGE SHOULD BE OPERATED**
17 **OPTIMALLY TO BETTER INTEGRATE RENEWABLE ENERGY AND**
18 **ULTIMATELY BENEFIT RATEPAYERS." PLEASE RESPOND TO THIS**
19 **CLAIM.**

1 A. Fairfield Pump Storage (“FFPS”) is dispatched optimally on a daily basis
2 with consideration for all expected loads and resources. DESC includes FFPS in
3 the daily DESC BA Daily Generation Plan and dispatches the units there to support
4 system loads as well as Operating Reserves. With the addition of solar generation,
5 DESC has increased its daily and hourly dependence on FFPS in both pump and
6 generator mode to maintain system reliability. Committing FFPS for only reserve
7 capability would require other more expensive generation to be dispatched to meet
8 system needs.

9 FFPS is not always available and is restricted at various times throughout the
10 year due to high river flows, environmental reasons (water temps at Monticello),
11 and maintenance outages. Further, as a limited energy resource, FFPS must be able
12 to pump enough water to meet its planned dispatch for the next peak load period.
13 The operation of FFPS must be planned to ensure there is sufficient water and space
14 available in the upper and lower pools to allow volume for FFPS to pump when
15 needed. As solar generation increases, the planning and operating of FFPS will be
16 stressed further. Likewise, the ability to meet the requirements of BAL-001 will
17 continue to become more difficult.

1 **Q. IN ORDER TO BETTER UNDERSTAND MR. STENCLIK'S CLAIMS**
2 **REGARDING DESC'S STATED NEED FOR RESERVES, PLEASE**
3 **EXPLAIN FROM A RELIABILITY PERSPECTIVE HOW DESC**
4 **BALANCED ITS SYSTEM BEFORE THE ADDITION OF SOLAR**
5 **RESOURCES?**

6 A. Balancing the system within the DESC BA required Operating Reserves to
7 maintain system reliability and compliance with the NERC Standards. That was
8 true before solar and is required even more now. Prior to solar generators within
9 the DESC BA, the reserves required to regulate were lower since the generators
10 within the DESC BA could be dispatched and controlled. As non-dispatchable
11 generation increases, so does DESC's requirement for Operating Reserves.

12 DESC still has a mix of generating resources with various operating
13 capabilities. Nuclear and steam units have slow ramp rates (the ability to
14 increase/decrease output) and are typically used as base load generation. Combined
15 cycle units and pumped storage have faster ramp rates and they are used to support
16 base load but can be held back to provide Operating Reserves. Due to
17 environmental limitations Saluda Hydro is limited in its ability to provide Operating
18 Reserves and can be called upon to provide contingency reserves in emergency
19 situations. Combustion turbines have quick start ups and fast ramp rates and are
20 used to support system peak and to provide Operating Reserves.

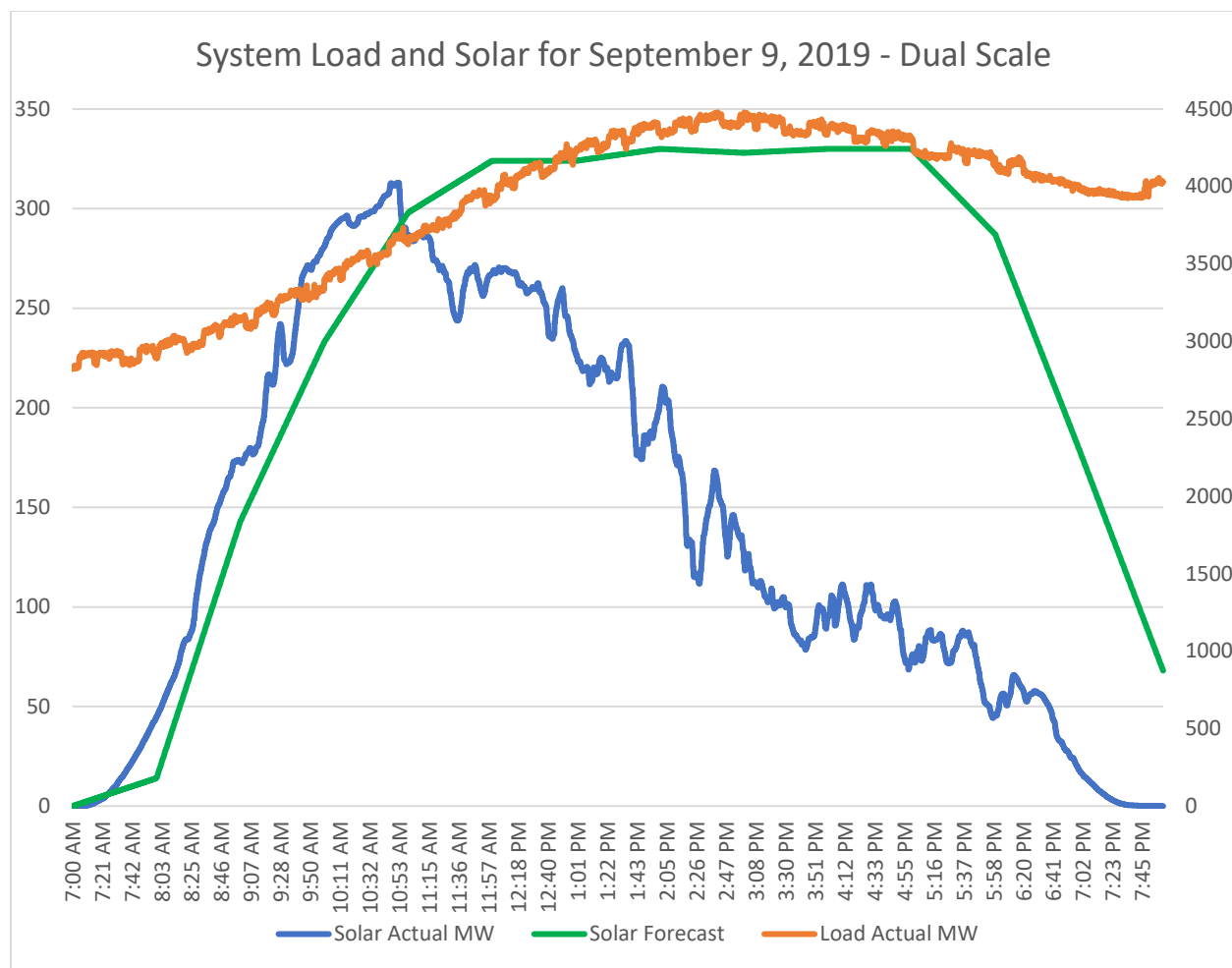
1 **Q. PLEASE EXPLAIN HOW THE ADDITION OF SOLAR GENERATION**
2 **COMPLICATES THE ABILITY TO BALANCE THE SYSTEM AND**
3 **COMPLY WITH MANDATORY RELIABILITY STANDARDS.**

4 A. The addition of solar generation places a resource to the DESC BA that is
5 variable, non-dispatchable and uncontrolled. Adding this type of resource to the
6 system has resulted in the need for maintaining increased levels of Operating
7 Reserves to account for the variability. This forces DESC to rely on combined cycle
8 plants to provide more reserves and less base load support. As a result of holding
9 them back from actively supplying load, combined cycle units cannot provide as
10 much efficient, low-cost generation to meet energy needs on the system as would
11 otherwise be the case. By way of example, this fall, DESC is installing Automatic
12 Generator Controls (“AGC”) on a large, combined cycle plant that has previously
13 provided generation to support base load. With the increase in solar variability, this
14 base load plant is being modified so that it will be able to adjust its output more
15 quickly and provide BAL compliance help. But when operating in AGC, much of
16 the capacity in the plant will have to be held in reserve so that it has uncommitted
17 capacity that can be added to the system on short notice to meet unforecasted
18 variations in generation supply or load. This means that this highly efficient plant
19 will be on the sidelines at times when it might otherwise be providing low cost
20 service to customers. Additionally, this modification will not help the system

1 respond to situations during light load periods when non-dispatchable solar
2 generation results in overgeneration and puts compliance with BAL-001 at risk.

3 **Q. WHAT ADDITIONAL CHALLENGES HAVE YOUR CONTROLLERS**
4 **EXPERIENCED WITH THE INTERMITTENCY OF SOLAR DURING THE**
5 **PEAK HOURS OF THE SUMMER MONTHS? DO YOU EXPECT THIS TO**
6 **BECOME MORE OR LESS CHALLENGING AS SOLAR APPROACHES**
7 **1,048 MW?**

8 A. The graph below is for September 9, 2019. On that day solar output peaked
9 at 10:30 AM and declined in a sawtooth pattern for the remainder of the day, more
10 than eight hours. When load peaked at approximately 3:30 PM that day, and at the
11 peak solar output was approximately 225 MW below its forecasted production. This
12 was a day in which there was less than 499 MW of solar connected to the grid. If
13 there had been over 1,000 MW of solar operating on September 9, 2019, the
14 situation would have been considerably more difficult.



Q. HOW WILL ADDITIONAL NON-DISPATCHABLE SOLAR AFFECT OPERATIONS IN THE SPRING AND FALL WHEN LOADS ARE LOWER?

A. The NERC compliance issues with solar are particularly difficult during periods when the weather is mild and demand for energy is low. Low loads combined with non-dispatchable solar generation result in periods of overgeneration, high voltage, high frequency, low CPS1 scores and possible non-compliance with BAL-001. When loads are low and solar generation surges, all DESC can do in response, short of curtailing solar, is back down its dispatchable

1 generation. This creates real operational issues. At a certain point, even that may
2 not be sufficient and the only option will be curtailment of solar. Addressing lower
3 loads in the fall, spring and many days in the winter will continue to be more
4 challenging as the amount of solar generation within the DESC BA increases.

5 **Q. BASED ON YOUR REAL-TIME OPERATIONS EXPERIENCE, DO YOU**
6 **THINK 35 PERCENT OPERATING RESERVES TIED TO RENEWABLE**
7 **GENERATION IS SUFFICIENT?**

8 A. No. System Control counts 60 percent of forecasted solar across the peak
9 hour as reliable power and from recent operating experience, considers 40 percent
10 to be at risk. DESC must therefore maintain reserves to support this remaining 40
11 percent of forecasted solar output which is not counted on for reliability purposes
12 and is assumed to be generation that could be lost. That number is more likely to
13 increase as solar generation increases within the DESC BA. This will in turn require
14 more operating reserves and resources with fast ramp rates. As you could see from
15 the above graphs, the greater amount of solar generation, the greater the need for
16 fast responding reserves.

17 **Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?**

18 A. Yes.